1882MNRAS..42..281M

interfere with the estimation of the contact seems to have been overlooked by the Conference. I refer to the bright line of light which encircles that portion of *Venus* outside the Sun's limb when a portion of her disk is projected upon the Sun. This line of light no doubt grows brighter as the moment of internal contact at ingress approaches, and there is great danger of its being mistaken for the Sun's limb about the moment of contact. It does not appear, however, that anything can be done except to caution the observer against this mistake. He must distinguish between this light and that of the true limb of the Sun as best he can.

VII. It is essential to the accuracy of observation that observers should practice on an artificial Transit. To get the best results from these instruments it is necessary that it should be so placed as to imitate as closely as possible the special phenomena of the actual Transit of *Venus.* These phenomena are atmospheric undulations, a softening of the outline of the Sun's disk and the partial illumination of the background.

I have said nothing on the subject of photography, because I cannot, in a small space, add anything of material value to the contents of my paper of 1872 published as Part I. of the papers prepared by the American Commission on the subject. It was there pointed out that only one practicable method had been proposed for an accurate determination of the solar parallax from photographs of the Transit, and I am not aware that the difficulties there pointed out were obviated in any other plan for photographing the Transit. As an example of what may be done under the most unfavourable circumstances, and on a first trial, by the horizontal meridian photoheliograph, reference may be had to Part I. of the American "Transit of Venus Observations."

Alleged Errors in the Time-Record of Observations of the Transit of Venus, at Hermitage, Rodriguez. By Lieut. W. Usborne Moore, R.N.

(*Communicated by the Astronomer Royal.*)

Page 397 of the account of the observations of the Transit of *Venus*, 1874, contains a note, which suggests four mistakes in time at Ingress and four at Egress, both groups of errors being in the same direction. I feel it my duty to record my respectful dissent from this note, feeling sure that no such mistakes were made, and that any calculations based on the assumption that a minute is to be added will be in error.

The Greenwich sidereal times at the principal phases observed at the three Rodriguez stations are recorded in the following table :—

1882MNRAS..42..281M

Point Venus.		*Point Coton.*		*Hermitage.*	
Phase observed.	Greenwich Sidereal Time.	Phase observed.	Greenwich Sidereal Time.	Phase observed.	Greenwich Sidereal Time.
		Ingress.		Phases from my Note-book.	
	h m s		h m s		h m s
Circular Contact	7 38 36·9	Simple Internal Contact... ...	7 38 54·8	Circular Contact	7 37 20·2
Change of colour of ligament	7 39 3·9			Broad ligament forming ...	7 37 31·6
				Planet's disk apart from limb of Sun	7 38 12·6
Disappearance of ligament .	7 39 27·2	Total disappearance of black hazy drop	7 39 31·5	Ligament assumed a more definite shape	7 39 23·6
				Saw ligament snap	7 39 48·6
		Egress.			
Formation of ligament ...	11 8 39·7	First appearance of brown haze .	11 8 42·2	Link formed	11 7 46·4
		First appearance of black hazy drop	11 8 50·8	Apparent Internal Circular Contact (fig. 3, p. 395) ...	11 8 37·5
Apparent Contact (fig. 2, p. 366)	11 9 57·3	Circular Contact	11 9 29·7	Can see that portion of *Venus* outside the Sun's limb; a dark brown colour, with limb slightly illuminated (fig. 4, p. 395).	11 10 50·5

1882MNRAS..42..281M

It is no part of my business to reconcile the times shown here to be at variance, but rather to demonstrate briefly the improbability of the mistakes imputed. I may, however, point out that the interval of $1^m\ 10^s$ without change of phenomenon, at Ingress, at Hermitage, is no more remarkable than that of $1^m\ 33^s$ during Egress at Suez. The observer remarks (p. 395) that the Sun was too strong for him, and from personal observation I can state that the "boiling," or agitation of the Sun's limb was excessive, owing to the close neighbourhood of a low cloud which was slowly moving, thus changing the conditions of refraction caused by the vapour at its edge. These circumstances may help to account for the interval.

Respecting Egress: it will be noticed that fig. 3, p. 395, illustrates a phase at least a minute previous to fig. 2, p. 366. It is clear that what was Internal Contact to the observer at Point Venus was not Internal Contact to the observer at Hermitage.

It may be considered as some evidence in favour of the correctness of the minutes at Egress that fig. 4, p. 395 (and fig. 145 of the Parliamentary Report), with accompanying description, assuredly indicate a phase not less than $2^m\ 13^s$ after Internal Contact.

It is right to mention that, to the best of my belief, the second and minute hands of the Parkinson and Frodsham chronometer corresponded very nearly; that the second hand had unequal arms, and could not be observed at the wrong side of the dial; that I had been in the habit of using this and similar chronometers for over two years of surveying duty; that during the week previous to the Transit I had taken time for over 200 observations; that comparisons were frequent; that between Ingress and Egress I took 45 observations of the Sun, timing myself: comparisons followed Egress; then noon comparisons, afternoon Sun observations, and night observations of rockets. The watch, in short, was thoroughly familiar. Before Ingress the "minutes" especially were watched in order that the observer might be informed when the contact should occur by Nautical Almanac. The question arises—Is it probable that the watch was read wrong eight times, and only for the critical phenomena, and that the error of one minute had in every case the *same sign*?

[The following is an exact copy of the original record of the observations in Lieut. Hoggan's note book. It will be remarked that in the case of one of the times recorded at Ingress, an alteration had been made in the figures.—W. H. M. Christie.]

Observations of the Transit of Venus, 1874, at Hermitage, Rodriguez.

Copy of Lieut. Hoggan's Note-book.

N.B. Until 6.10 clouds obscured the Sun.

About 6.10 first saw the planet on the Sun about ¼ on.

1882MNRAS..42..281M

Great atmospheric disturbance. Planet and Sun's limb very shaky, using lowest power in the telescope.

Sun obscured by thick clouds.

Cloud cleared away.

h	m	s	
6	21	40	Saw Sun and planet.
	22	21·8	Planet a little more than ½ way on. Great atmospheric disturbance. 2nd power, yellow eyepiece. Venus boiling all round.
6	24	35·2	Cusps as sharp as can possibly be under circumstances. Outside the Sun (of *Venus*) brown colour. Inside the Sun, black.
6	26	30	Boiling seems to increase around the limb of *Venus* and the Sun. Cloud coming up.
6	27	30	A light cloud passing over. Shifted glass to light red.
6	28	0	Cusps still sharp.
6	28	44	Obscured.
6	33	0	Without shade. Cloud partially cleared away. Saw planet.
	33	17·5	Cusps still sharp; not quite circular contact. Put on red-glass eyepiece (No. 2).
	33	48	Just coming on to circular contact.
	33	36·2	Not quite circular contact. (Nearly sure this is 56^s.—W. U. M.)
	34	4·8	I conceive this to be circular contact.
	34	16	Black drop forming, broad ligament—or disk of planet well on Sun.
	34	57[*]	Only ligament, planet disk not joined to Sun. Immense boiling.
	36	7·9	Ligament assumed a more definite shape.
	36	17·4	Ligament getting perceptibly narrower.
	36	32·8	Saw a ligament snap (fade away would be the proper term). I believe this to be internal contact.
	36	43·2	Fancy saw a ligament about as broad as a needle snap. Immediately after planet appeared well on Sun's disk.
	41	0	Sun obscured.

Remarks 15 minutes after:—

The atmospheric disturbance around the Sun's limb and the planet's limb was such as to render it impossible for me, although I watched very carefully, to distinguish the various changes of the black drop with great accuracy.

This I did notice, that the ligament decreased in width without increasing in length very perceptibly. I noticed no

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[*] The figures have been altered in the observer's book. This appears to have been written originally 35·37, and afterwards altered to 34·57.